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Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Army										DATE: April 2013		
APPROPRIATION/BUDGET ACTIVITY 2040: Research, Development, Test & Evaluation, Army BA 2: Applied Research					R-1 ITEM NOMENCLATURE PE 0602783A: COMPUTER AND SOFTWARE TECHNOLOGY							
COST (\$ in Millions)	All Prior Years	FY 2012	FY 2013 [#]	FY 2014 Base	FY 2014 OCO ^{##}	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
Total Program Element	-	8.433	9.830	10.439	-	10.439	10.501	10.411	11.065	11.155	Continuing	Continuing
Y10: COMPUTER/INFO SCI/TECH	-	8.433	9.830	10.439	-	10.439	10.501	10.411	11.065	11.155	Continuing	Continuing
# FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012												
## The FY 2014 OCO Request will be submitted at a later date												
Note FY14 increase for language translation efforts.												
A. Mission Description and Budget Item Justification This program element (PE) develops and evaluates hardware and software algorithms enabling enhanced understanding and accelerating the decision cycle time for commanders and leaders operating in a mobile, dispersed, highly networked environment. Project Y10 supports research on information and communications technology. Work in this PE complements and is fully coordinated with efforts in PE 0602705A (Electronics and Electronic Devices), 0602716A (Human Factors Engineering Technology), PE 0602782A (Command, Control, Communications Technology), PE 0603772A (Advanced Tactical Computer Science and Sensor Technology), and PE 0603008A (Command, Control, Communications Advanced Technology). The cited work is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy. Work in this project is performed by the Army Research Laboratory (ARL) at the Adelphi and Aberdeen Proving Ground, MD locations.												

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APPROPRIATION/BUDGET ACTIVITY		R-1 ITEM NOMENCLATURE			
2040: Research, Development, Test & Evaluation, Army		PE 0602783A: COMPUTER AND SOFTWARE TECHNOLOGY			
BA 2: Applied Research					
B. Program Change Summary (\$ in Millions)	FY 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total
Previous President's Budget	8.577	9.830	8.939	-	8.939
Current President's Budget	8.433	9.830	10.439	-	10.439
Total Adjustments	-0.144	0.000	1.500	-	1.500
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.144	-			
• Adjustments to Budget Years	-	-	1.500	-	1.500

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COST (\$ in Millions)	All Prior Years	FY 2012	FY 2013 [#]	FY 2014 Base	FY 2014 OCO ^{##}	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
Y10: COMPUTER/INFO SCI TECH	-	8.433	9.830	10.439	-	10.439	10.501	10.411	11.065	11.155	Continuing	Continuing
# FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012												
## The FY 2014 OCO Request will be submitted at a later date												
Note Not applicable for this item.												
A. Mission Description and Budget Item Justification This project develops and evaluates information and communications processing software to automate the delivery of information for planning, rehearsal, and execution by ground commanders. Efforts develop communication/network architectures and software and the information fusion software necessary to simplify the understanding and interactions from humans to humans, humans to computers, computers to humans. Research results in enable enhanced understanding of many information sources and for accelerating the decision cycle time for commanders and leaders operating in mobile, dispersed, highly networked environment envisioned for the future force. This project supports Army science and technology efforts in the Command, Control, Communications and Intelligence portfolio. Work in this project is fully coordinated with PE 0603008A (Command, Control, Communications Advanced Technology)and PE 0603772A (Advanced Tactical Computer Science and Sensor Technology). The cited work is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy. Work in this project is performed by the Army Research Laboratory (ARL), Adelphi and Aberdeen Proving Ground, MD.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2012	FY 2013	FY 2014	
Title: Information Processing									1.293	1.222	1.237	
Description: This effort develops and evaluates fusion software to improve the completeness and timeliness of decision-making in command and control (C2) operations. The goal of this effort is to develop software applicable to the Distributed Common Ground Station-Army (DCGS-A) architecture (an integrated architecture of all ground/surface systems) and for future force assessment.												
FY 2012 Accomplishments:												

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2012	FY 2013	FY 2014
Extended network analysis tools, interfaces, and visualization routines for Army intelligence to parallel architectures/algorithms and evaluated them in relevant tactical exercises, like Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) On-the-Move. FY 2013 Plans: Continue to develop scalable decision support and social network analysis algorithms; evaluate network and information visualization software for cellular wireless environments. FY 2014 Plans: Will extract/resolve and exploit social network information from multi-source data in order to provide timely accurate assessments of social and cultural influences for small unit decision making.				
Title: Information Assurance Description: This effort designs and evaluates software for the protection of information and networks in wireless tactical environments. The goal is to develop software algorithms that detect and defeat malicious activities of adversaries in the bandwidth constrained tactical networks. FY 2012 Accomplishments: Evaluated techniques for trading off intrusion detection system (IDS) system performance and overall network performance in terms of network security metrics. FY 2013 Plans: Design and evaluate new software algorithms and architectures, along with predictive models, for distributed intrusion detection of cyber attacks in bandwidth-constrained environments. FY 2014 Plans: Will evaluate experimental implementation of intrusion detection software algorithms and architectures; develop and analyze predictive models for distributed intrusion detection of cyber attacks in bandwidth-constrained environments, efforts will improve our ability to detect and defeat malicious activities on Army networks and hosts.		0.982	1.166	1.180
Title: Information Exchange Description: This effort will investigate and develop software that integrates sensor data from local and external information sources. The goal is to enable tactical users to cooperatively share relevant and timely tactical information within a distributed wireless environment. FY 2012 Accomplishments:		1.177	1.249	1.264

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2012	FY 2013	FY 2014
Extended experiments to social network analysis, fusion and collection techniques in a wireless distributed fusion environment, and developed metrics for assessing their overall effectiveness within the DCGS-A Cloud architecture. FY 2013 Plans: Develop and assess fusion and information exchange software to reduce network bandwidth necessary to transmit information; evaluate the software using tactically realistic equipment and text/video data. FY 2014 Plans: Will develop workflow and algorithms to enable end-user's ability to define and refine the collection, correlation, and aggregation of raw and processed data from both local and higher echelon information sources to produce summaries that are directly relevant to the user's current operations.				
Title: Language Translation Description: This effort develops and assesses computational multilingual algorithms and software frameworks to enable commanders and troops to bridge language barriers in order to counter adversaries and collaborate with allies. FY 2012 Accomplishments: Integrated additional tools to automate development of new optical character recognition and machine translation (OCR/MT) rapidly from prepared data and developed and evaluated use of mobile applications for language translation functions. FY 2013 Plans: Develop and evaluate adaptive OCR/MT workflow analysis software to improve the quality of automated reasoning techniques when applied to human intelligence documents (both foreign and English). FY 2014 Plans: Will develop an experimental framework for evaluation of state-of the-art academic OCR/MT, entity extraction, and entity resolution algorithms using realistic, representative data; develop, refine, and test advanced algorithms to improve multilingual and machine translation technologies in three areas: (a) OCR of noisy and degraded document images typical of field-captured materials, (b) domain-specific machine translation targeting domains and genres outside of commercial interest, and (c) recognition of key content in handwritten documents typical of pocket litter and other materials commonly encountered in the field to facilitate the rapid transition of promising candidate technologies.		0.579	1.631	2.134
Title: Network Theory Description: This effort investigates and designs theory based software models to evaluate and validate emerging network protocols and structures. The goal of this effort is to develop software algorithms that maintain effective communications in		1.851	1.865	1.887

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2012	FY 2013	FY 2014
networks in spite of disruptive effects such as task reorganization, mobility of friendly forces, and adversarial attacks on friendly networks. FY 2012 Accomplishments: Investigated and evaluated techniques for controlling the behavior of hybrid networks using a measure of information quality to enhance the overall network performance for improved decision making. FY 2013 Plans: Continue to investigate and evaluate algorithms to improve delivery time and quality of information in unreliable tactical mobile networks; investigate and evaluate software algorithms that exploit network user movement and usage to improve communication and information delivery. FY 2014 Plans: Will investigate and evaluate techniques for improving network performance and Soldier decision making by adapting data processing and delivery behaviors based on current network abilities and user information quality preferences; develop and evaluate non-traditional communications techniques (i.e. optical and Ultra Violet) to provide alternative means of communications in RF-challenged environments; investigate techniques for using mobile infrastructure and user movement to improve communication networks and information delivery in hybrid (wired & wireless) networks.				
Title: Heterogeneous Computing and Computational Sciences Description: This effort researches and develops software algorithms to allow information processing across different computing hardware platforms. The goal of this research is to provide high performance computing (HPC) equivalent processing capabilities to the Soldier on the battlefield. FY 2012 Accomplishments: Investigated scalable interface algorithms on heterogeneous computing systems for battlefield and biometric applications. FY 2013 Plans: Develop and evaluate scalable algorithms for battle command applications, such as modeling electromagnetic propagation in urban areas on a HPC cloud hybrid computing platform; evaluate algorithm performance and accuracy for developing high fidelity models of complex battlefield scenarios. FY 2014 Plans: Will develop, implement and validate discrete mathematical algorithms for high fidelity electromagnetic propagation and electromagnetic interference for use in real time modeling and optimization of ad hoc mobile networks; test, analyze, and optimize the performance of current and proposed mobile ad hoc network simulations; develop code enabling algorithm deployment for		0.980	1.033	1.045

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2012	FY 2013
extremely large networks using inter-core load balancing between standard computing cores and specialized accelerators such as Graphics Processing Units, and perform validation of the models and results based on standard battle command benchmark problems.			
Title: Material Modeling-Force Protection Description: This effort designs and evaluates software to improve parallel processing for computational intensive physics. Intent is to create a computational science environment to assist researchers from different disciplines to work collaboratively and to exchange models and results. FY 2012 Accomplishments: Explored innovative approaches in developing a parallel computational framework for next generation petaflop high-performance computers (both cluster and hybrid computers) to study coupled nonlinear multi-scale material problems on a massive scale. FY 2013 Plans: Design new parallel computational science environment architecture, as well as theory and implementation strategies for coupling multi-physics modeling software; Evaluate new data models and formats for using petascale data from multi-physics applications to enable higher resolution/fidelity simulations. FY 2014 Plans: Will develop parallel computational common software environment on emerging multi-core petaflop HPC computing systems; implement interface algorithm, data models and formats to solve multi-scale/multi-physics software developed for coupling between molecular dynamics and finite element methods.		1.571	1.664
Accomplishments/Planned Programs Subtotals		8.433	9.830
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.			